Claims

1. Pattern defect detecting equipment, comprising:

a laser source ~~means~~ for emitting an ultraviolet laser beam;

coherence reducing means for reducing the coherence of the ultraviolet laser beam emitted from said laser source ~~means~~;

objective lens means for irradiating a sample with said ultraviolet laser beam passing through said coherence reducing means;

image detecting means for detecting an image of said sample irradiated with the ultraviolet laser beam through said objective lens means;

storage means for storing a comparison image signal; and

defect detecting means for detecting a defect in a pattern formed on said sample by comparing an image signal of said sample which is outputted from said image ~~detecting~~ means ~~detecting an image of said sample~~ to the comparison image signal stored in said storage means.

2. Pattern defect detecting equipment according to Claim 1, wherein said coherence reducing means scans said ultraviolet laser beam over a pupil of said objective lens means.

3. Pattern defect detecting equipment according to Claim 1, wherein said coherence reducing means has an optical path part

consisting of a plurality of optical fibers or glass rods whose lengths are mutually varied, and the ultraviolet laser beam emitted from said laser source ~~means is made to go~~ into a plurality of the optical fibers or glass rods of said optical path part ~~by~~ at one end thereof and made to go out of another end thereof on said objective lens side.

4. Pattern defect detecting equipment according to Claim 1, wherein said coherence reducing means has an optical path part consisting of a plurality of optical fibers or glass rods, and the ultraviolet laser beam emitted from said laser source ~~means~~ is ~~made to go into~~ inputted in an oblique direction into a plurality of the optical fibers or glass rods of said optical path part ~~by~~ at one end thereof and made to go out of another end thereof on said objective lens side.

5. Pattern defect detecting equipment, comprising:

a laser source ~~means~~ for emitting an ultraviolet laser beam;

coherence reducing means for reducing the coherence of the ultraviolet laser beam emitted from said laser source ~~means~~;

objective lens means for irradiating a sample with said ultraviolet laser beam passing through said coherence reducing means;

table translation means movable in a X-Y plane with said sample mounted on it;

time-delay integration type image sensor means for detecting an image of said sample irradiated with said ultraviolet laser beam through said objective lens means;

controlling means for controlling timing between translating of said table translation means and imaging of said time-delay integration type image sensor means;

storage means for storing a comparison image signal; and

defect detecting means for detecting a defect of a pattern formed on said sample by comparing an image signal based on the image of said sample detected with said time-delay integration type image sensor means to the comparison image signal stored in said storage means.

6. Pattern defect detecting equipment according to Claim 5, wherein said coherence reducing means scans said ultraviolet laser beam over a pupil of said objective lens means.

7. Pattern defect detecting equipment according to Claim 5, wherein said pattern defect detecting equipment has an optical path part consisting of a plurality of optical fibers or glass rods whose lengths are mutually varied, into which the ultraviolet laser beam being emitted from said laser source goes by one end of a plurality of said optical fibers or glass rods and goes out of the other end thereof on said objective lens side.

sub a7 8. Pattern defect detecting equipment according to Claim 5, wherein said pattern defect detecting equipment has an optical path part consisting of a plurality of optical fibers or glass rods whose lengths are mutually varied, into which the ultraviolet laser beam being emitted from said laser source goes, in an oblique direction, by one end of a plurality of said optical fibers or glass rods and goes out of the other end thereof on said objective lens side.

sub a7 9. Pattern defect detecting equipment, comprising:

an ultraviolet laser source;

coherence reducing means for reducing the coherence of an ultraviolet laser beam emitted from said ultraviolet laser source;

projecting means for projecting the ultraviolet laser beam passing through said coherence reducing means on a pupil of an objective lens;

illuminating means for illuminating a detection field of view in the object uniformly by the ultraviolet laser beam projected on the pupil of said objective lens by said projecting means through the objective lens;

image detecting means for detecting an image of said object illuminated almost uniformly by said illuminating means; and

detecting means for detecting a defect on said object by comparing the image data obtained from the image of said object detected with said image detecting means to the image data stored beforehand.

10. Pattern defect detecting equipment, comprising:

A a laser source ~~means~~ for emitting an ultraviolet laser beam;

coherence reducing means for reducing the coherence of the

A ultraviolet laser beam emitted from said laser source ~~means~~;

A irradiating means for irradiating ~~the~~ a sample with the ultraviolet laser beam whose coherence was reduced by said coherence reducing means;

A image detecting means for detecting ~~the~~ an image of the sample irradiated with the ultraviolet laser beam by said

A irradiating means; and

defect detecting means for detecting a defect of the pattern formed on said sample based on information concerning the image of said sample detected with said image detecting means.

11. Pattern defect detecting equipment according to Claim 10, wherein said coherence reducing means is means for reducing at least the temporal coherence of the ultraviolet laser beam

A emitted from said laser source ~~means~~.

12. Pattern defect detecting equipment according to Claim 10, wherein said coherence reducing means includes means for scanning a light spot, which is formed of converged rays of light, on a pupil of the irradiating means.

13. Method of detecting a pattern defect comprising the steps of:

emitting an ultraviolet laser beam from a laser source;

irradiating a sample with said emitted ultraviolet laser beam through coherence reducing means and an objective lens;

detecting an image of said sample irradiated with said ultraviolet laser beam through said objective lens; and

detecting a defect of a pattern formed on said sample by comparing an image signal of the image of said sample detected through said objective lens to a comparison image signal stored in storage means.

14. Method of detecting a pattern defect according to Claim 13, wherein the spatial coherence of said ultraviolet laser beam with which said sample is irradiated through said coherence reducing means is reduced.

15. Method of detecting a pattern defect according to Claim 13, wherein the ultraviolet laser beam for irradiating said

sample through said coherence reducing means is detected on said sample with the temporal coherence reduced.

A 16. Method ~~for~~ of detecting a pattern defect comprising the steps of:

emitting an ultraviolet laser beam from a laser source;

irradiating a sample mounted on a table movable in a plane with said emitted ultraviolet laser beam through coherence reducing means and an objective lens; and

detecting an image of said sample irradiated with said ultraviolet laser beam through said objective lens with a time-delay integration type image sensor in synchronization with A translation of said table; wherein the method ~~is~~ further A ~~comprising~~ comprises a step of detecting a defect of a pattern formed on said sample by comparing an image signal based on the image of A said sample detected with said time-delay integration type image A sensor ~~means~~ to a comparison image signal stored beforehand.

A 17. Method ~~for~~ of detecting a pattern defect according to Claim 16, wherein the spatial coherence of the ultraviolet laser A beam ~~wherewith~~ with which said sample is irradiated through said coherence reducing means is reduced.

A 18. Method ~~for~~ of detecting a pattern defect according to A Claim 16, wherein the ultraviolet laser beam ~~wherewith~~ with which said

sample is irradiated through said coherence reducing means is detected on said sample with its temporal coherence reduced.

19. Method ~~for~~ of detecting a pattern defect according to Claim 16, wherein said coherence reducing means comprises a plurality of optical fibers or glass rods whose lengths are mutually different and the spatial coherence of said ultraviolet laser beam is ~~deceased~~ decreased by making said ultraviolet laser beam pass through said coherence reducing means ~~comprising a plurality of the optical fibers or the glass rods whose lengths are mutually different.~~

20. Method ~~for~~ of detecting a pattern defect according to Claim 16, wherein said coherence reducing means comprises a plurality of optical fibers or glass rods and reduces said spatial coherence of said ultraviolet laser beam by making said ultraviolet laser beam go into the coherence reducing means in an oblique direction and pass through said plurality of the optical fibers or ~~the~~ glass rods.

21. Method ~~for~~ of detecting a pattern defect according to Claim 16, wherein said spatial coherence of said ultraviolet laser beam is reduced by changing a position of a speckle pattern on said sample formed by the ultraviolet laser beam ~~wherewith~~ with which said

sample is irradiated within a time shorter than said detection time.

22. Method ~~for~~ of detecting a pattern defect comprising the steps of:

scanning ~~a~~ an ultraviolet laser beam emitted from a laser source over a pupil of an objective lens;

irradiating a sample with the ultraviolet laser beam ~~scanning over said pupil~~ passing through said objective lens;

detecting an image of said sample irradiated with said ultraviolet laser beam with a storage-type detector; and

detecting a defect of a pattern formed on said sample using an image signal of said sample detected with said storage-type detector.

23. Method ~~for~~ of detecting a pattern defect according to Claim 22, wherein a period of the scanning of said ultraviolet laser beam over the pupil of the objective lens is shorter than a storage time of said storage-type detector.

24. Method ~~for~~ of detecting a pattern defect comprising of the steps:

emitting a laser beam whose wavelength is not longer than 400 nm from a laser source;

irradiating a sample with said emitted laser beam through coherence reducing means;

detecting an image of said sample irradiated with said laser beam; and

detecting a defect of a pattern formed on said sample based on information concerning said detected image of said sample.

A 25. Method ~~for~~ of detecting a pattern defect according to Claim 24, wherein the spatial coherence of the ultraviolet laser beam with which said sample is irradiated through said coherence reducing means is reduced.

A 26. Method ~~for~~ of detecting a pattern defect according to Claim 24, wherein the ultraviolet laser beam with which said sample is irradiated through said coherence reducing means is detected on said sample with the temporal coherence reduced.

SWB a2 27. Method for detecting a pattern defect, comprising the steps of:

emitting coherent light from a light source;

reducing the coherence of said emitted coherent light on the way of its optical path;

irradiating a sample with said light whose coherence was reduced through an objective lens;

detecting an image of said sample irradiated with said light whose coherence was reduced with a storage-type detector through said objective lens; and

detecting a defect of a pattern formed on said sample by comparing an image signal obtained from the image of said sample detected with the storage-type detector to a comparison image signal stored beforehand.

28. Method ~~for~~ of detecting a pattern defect, comprising the steps of:

emitting an ultraviolet laser beam from a laser source;

irradiating a semiconductor wafer, where a circuit pattern was formed, with said emitted ultraviolet laser beam through coherence reducing means and an objective lens;

detecting an image of said circuit pattern irradiated with said ultraviolet laser beam with a solid state imager through said objective lens; and

detecting a defect not larger than 0.2 μm on said semiconductor wafer by comparing an image signal based on the image of said circuit pattern detected with said solid state imager to a comparison image signal stored beforehand.